

Serial No. 10/698,920

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Appl. No. : 10/698,920  
Applicant(s) : Daniel C. Conrad, et al.  
Filed : October 31, 2003  
T.C./A.U. : 1751  
Examiner : Amina S. Khan  
Docket No. : US19984054-8  
(31480.3)

I hereby certify that this correspondence is being mailed to the U. S. Patent and Trademark Office, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date indicated below.

Name : Eileen T. Mathews

Signature: 

Date : March 11, 2008

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**Declaration Under 37 § C.F.R. 1.131**

Dear Sir:

I, one of the inventors, hereby declare as follows:

1. I am a named co-inventor of the subject matter that is claimed and for which a patent is sought on the invention as above mentioned. This U.S. Application Serial No. 10/698,920 was filed on October 31, 2003. This application is a continuation-in-part of U.S. Application Serial No. 10/027,160 which was filed on December 20, 2001, and U.S. Application Serial No. 10/027,431 filed on December 20, 1998, which claim the benefit of the earlier filing date of provisional patent application 60/045,072 filed on April 29, 1997. I have reviewed the subject matter of provisional application 60/045,072 and can attest that the subject matter of the Applicants' independent claims are supported by the Application. As such, the pending Application Serial No. 10/698,920 has an earliest effective filing date of April 29, 1997.

2. In the Office Action dated September 11, 2007, the United States Patent and Trademark Office (USPTO) rejected claims 1-13, and 24-37 under section 103(a) as being unpatentable over by Flynn et al., US Patent No. 5,962,390, filed on May 17, 1996 and issued on October 5, 1999, which is a continuation-in-part of application serial no. 08/573,416 filed on December 15, 1995, and which claims the benefit of application no. 08/375,812, filed on January 20, 1995, now abandoned, (hereinafter "Flynn et al."), and in view of each of the secondary

Serial No. 10/698,920

references, Dickey, et al. (US 3,410,118), De Pas et al. (US 3,163,028), Tatch et al. (US 5,431,827) and Krugmann (US 4,252,546).

3. Claims 1-13, and 24-37 of Application Serial No. 10/698,920 which have a priority date of April 29, 1997 are not obvious over Flynn et al., in view of the secondary references.

4. Per applicable U.S. patent law, Flynn et al. 5,962,390 has an effective 102(e) date of May 17, 1996 (the filing date).

5. This written document is a declaration of prior invention to antedate the cited reference of Flynn et al. 5,962,390. I, an Inventor of the subject matter of the rejected claims, hereby submit this declaration to overcome this reference. I performed certain acts described below.

#### **I. Showing of Facts Through Document Evidence**

6. Below are facts that show a conception of the invention on or before the May 17, 1996 filing date of Flynn et al. 5,962,390 coupled with due diligence from such conception to a subsequent actual reduction to practice or to the provisional application filing date of 29 April 1997.

7. Exhibit A and Exhibit B were previously submitted in an Affidavit which I executed on January 2, 2007 and was filed on March 2, 2007 along with a Response to Office Action dated November 2, 2005. Exhibits C, D, E, F, and G are submitted herewith and were created to summarize a brainstorming session prior to May 17, 1996. Exhibit H is evidence of the Exhibits stored in the "Whirlpool Information Network" showing the dates these documents were inputted into the network. Exhibit I is also submitted herewith and is a report dated August 15, 1996 of a laboratory study for research which was initiated prior to May 17, 1996.

8. Exhibit H shows the digitized records saved on the Whirlpool Information Network. The information is controlled digitized evidence which is password protected for read-only access. The "Date Composed" is the dates the specific documents were saved in the network following the brainstorming session. Exhibit H shows that the dates Exhibits C, D, E, F and G were saved to the network were on March 1, 1996, March 7, 1996 and May 6, 1996 and prior to May 17, 1996.

9. Exhibit I is a Report 517720-005 entitled "Detergent Properties of Hydrocarbons, Fluorocarbons and Microemulsions" of a study which determined the detergent properties of various compounds such as alcohols, carboxylic acids, esters, fluorocarbons, ketones, and terpenes. The report of Exhibit I discusses the background concerns of dry cleaning compounds that were traditionally used as well as the test set-up, fabric washing methods and results.

Serial No. 10/698,920

Several fabric types were laundered in a simulated washing machine, a tergotometer and tested for reactivity with the various fabrics.

**A. Facts establishing conception**

10. In general, the facts of Exhibits C, D, E, F, G, H and I are hereby incorporated by reference. Moreover, I present the following facts to establish a conception of the invention before the May 17, 1996 Flynn et al. filing date.

**(i) Conception**

11. The basic inventive concept of the application is the fluid composition used in non-aqueous laundering.

12. The USPTO presents Flynn et al. as teaching a variety of solvents suitable for dry cleaning applications which also meets the properties required of Applicants' working fluid. However, as explained in the contemporaneously filed Response to non-final Office Action dated March 11, 2008, Flynn et al. do not disclose a wash liquor for laundering a fabric load in an automatic laundering apparatus. Flynn et al. is directed to cleaning substrates, primarily metal and does not teach wash liquor compositions for cleaning fabric loads. Flynn et al. do not disclose a bulk fluid that is inert and having the properties as claimed for use in an automatic laundering apparatus.

13. The details of previously submitted Exhibit A and contemporaneously submitted Exhibits C, D, E, F, G and H support conception of the claimed invention and show "Project Hope" encompasses non-aqueous working fluid chemistries. Thus, the scope of this declaration is commensurate with the scope of the claimed subject matter.

14. Particularly, Exhibit C shows the Domain of Fabric Laundering through discussion ideas concerning bulk fluid "Chemistry", "Machine Characteristics and Structure" and "Cycles/Processes". The Venn Diagram shows that Project Hope was concerned with researching non-reactive, inert bulk fluids which included fluoroinerts, FI, and yet possessed properties were outside the domain or "space" of the traditional bulk fluids, namely, water, perc, and carbon dioxide which were "reactive" bulk cleaning fluids possessing relatively high Kauri-Butanol values for cleaning ability. We conceived a wash liquor for cleaning a load of fabric in an automatic laundering apparatus, for example a home laundering unit, and that such cleaning can be accomplished through mechanical cleaning where the "bulk" of the wash liquor is inert and substantially less portion of the wash liquor is additives. We conceived and determined that it would not be required that bulk dry-cleaning fluids of the wash liquor possess the reactive properties of chemicals known to be used in dry cleaning at that time. Fluoroinerts have a Kauri-Butanol value less than 30 and are relatively non-reactive to known bulk fluids of dry-cleaning wash liquors. The perc compounds replaced earlier low flash point hydrocarbons for non-aqueous dry-cleaning and this is well documented in dry-cleaning literature. Although some of the hydrocarbon compounds were considered "non-reactive" and having relatively low KB

Serial No. 10/698,920

values, these "oleophilic" compounds which were already replaced by perc we conceived of "non-oleophilic" compounds. Therefore the desired "non-aqueous", "apolar" bulk dry-cleaning fluids were to be inert or "non-reactive" to several fabrics and also compatible with additives such as oxygen bleach, detergents which include fragrance, co-solvents, enzymes, etc. Such bulk fluid chemistries were considered in conjunction with in-home washing machine equipment and various wash cycles and processes as indicated by the topic headings of Exhibit C and which were discussed in the brainstorming session of Project Hope.

15. Exhibit D lists the characteristics of fluoroinerts which were relevant in developing testing protocol.

16. Exhibit E lists the potential property characteristics (i.e. "FuFu") of the desired "non-aqueous", "non-reactive", "non-oleophilic" and "apolar" working fluids for use in a laundering method in an automatic laundering apparatus. Exhibit F shows that the desired inert working fluid is defined as "does no cleaning" and "fabric stability" which was outside the scope of the known compounds for wash liquors which cleaned fabric loads at the time.

17. The previously filed Exhibits A and B pertaining to Project Hope also illustrates desired characteristics of the inert working fluid chemistries and the various characteristics of an exemplary non-aqueous working fluid and that hundreds of compounds were selected for further testing and that several were currently being bench tested. Exhibit B listed some of the testing protocols.

18. Exhibit G is a table of several compounds which were evaluated. Exhibit H shows the document of Exhibit G is entitled "Updated Non-Aqueous Matrix" which was composed (i.e. entered into the network) on May 6, 1996.

**(ii) Effective date of Flynn et al.**

19. As indicated on the face of the Flynn et al. patent, issued on October 5, 1999, and has a section 102(e) date (filing date) of May 17, 1996. Accordingly, the date to overcome is May 17, 1996.

**(iii) On or before the effective date of Flynn et al.**

20. I allege that the acts relied upon to establish the date on or before May 17, 1996. The testing and the exhibits attached were generated prior to the effective date of Flynn et al.

**B. Facts establishing reduction to practice**

21. In general, the facts of Exhibits C, D, E, F and G are hereby incorporated by reference. Moreover, I present the following facts to establish a reduction to practice.

Serial No. 10/698,920

(i) Actual reduction to practice

22. After conception of the invention on or before May 17, 1996, I tested or had the invention tested to establish its capacity to successfully perform its intended purpose. Previously filed Exhibit B represents an invention testing protocol/assessment that discusses the experiments that would be run during a period starting before May 17, 1996 and into later parts of 1996. Contemporaneously submitted Exhibit I explain the background, testing methods and results of several non-aqueous inert fluids which could be used for laundering fabrics in an automatic laundering apparatus.

23. Previously filed Exhibit A and contemporaneously filed Exhibits C, D, E, F, G and H show information generated and dated prior to May 17, 1996 that show the many chemicals that were currently used in the industry and which were not subject of the desired compounds of the invention, and also, that of the many chemicals that exhibited some of the desired characteristics, several were chosen as candidates. Several candidates were benchtop tested.

(ii) Constructive reduction to practice

24. I allege that the present application for a U.S. patent recites independent claims of the same invention disclosed in the provisional application filed on April 29, 1997.

25. Therefore, constructive reduction to practice was achieved on April 29, 1997.

C. Facts establishing reasonable diligence

26. I present the following facts to establish that there was reasonable diligence from before the May 17, 1996 effective date of Flynn et al. to the actual reduction to practice of the invention or alternatively to the provisional filing date.

27. As noted above, conception occurred on or before the May 17, 1996 filing date of Flynn et al. Moreover, actual reduction to practice occurred on or before April 29, 1997. I assert that there was reasonable diligence from conception to reduction to practice, either actual or constructive. Exhibits C, D, E, F and G indicate that several inert working fluids were outside the scope of known reactive dry-cleaning fluids, and that such inert non-aqueous, non-reactive, non-oleophilic, and apolar working fluids were selected as having desirable characteristics and these chemicals were submitted for further bench testing. The characteristics were counter-intuitive of the characteristics of known dry-cleaning wash liquors used on fabric loads in an automated laundering apparatus. As Exhibits C, D, E, F, G, H and I show, I was cognizant of the need to pursue patent applications to protect the invention. The inventors timely filed a provisional patent application on April 29, 1997. The selection of chemicals, the experiments, conducted throughout 1996 and the actual filing of a patent application indicate a reasonable diligence period from on or before the Flynn et al. filing date.

Serial No. 10/698,920


28. Alternatively, the time period taken for the completion of the application constitutes reasonable diligence. During this time period, I and/or our representative worked reasonably hard and expeditiously to prepare, execute and file a patent application in the United States Patent Office. Accordingly, there was reasonable diligence from on or before the Flynn et al. filing date to the filing of the application of the present invention.

**II. Allegations and other Statements**

29. I allege that the acts relied upon to establish the date on or before Flynn et al. were carried out in the United States.

**III. Signature and Declaration in Lieu of Oath Under 37 CFR 1.68**

30. I hereby declare that the statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I acknowledge that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or patent issuing thereon.

  
Tremitchell Wright

3/11/08  
Date

**EXHIBIT C**Chemistry

Alternative to FI

Additives

- Oxygen bleach
- Detergents (non-traditional surfactants)
- Enzymes
- Brighteners
- Co-solvents
- 2 Phase cleaning

Solutions -

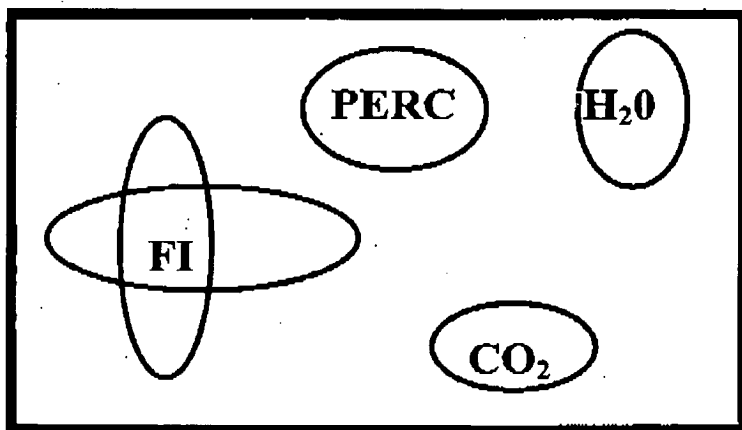
Cq FI and CO

FI and H<sub>2</sub>OMachine Characteristics, Structures

- Recovery
- Ventilation
- Containment
- Mechanical Input
- Dispensing
- Thermal Input
- Geometry of Fabric (hanging, batch vs. continuous drying in bag)
- Footprint

Cycles/Process

- Water followed by FI
- Mist
- Emulsion Wash
- Dry Cycle




**EXHIBIT D**Characteristics

<b>KNOWN</b>	<b>UNKNOWN</b>
FI not available at commercial prices	Fiber damage unknown
Displacement of H <sub>2</sub> O	Dye transfer unknown -
Low vapor pressure - need to avoid leaks	Quality of "grade" needed unknown
Osmotic gradients	Variability of molecule size effects drying rate, surface tension rate, surface tension
Low viscosity speeds penetration of fabric	Dielectric characteristics might reduce static or also allow control charge density of contaminants or can the charge surfactants
Broad range of FI's available	Unknown FI reactivity with additives
Cavitation in pumps	Solvency of particular soils unknown
FI is considered environmentally safe, non-toxic	FI non-polar might limit shrinkage of wool
pH neutral	Sanitization effect unknown
FI's have a wide range of vapor pressures - allows flexibility of heating characteristics	
FI absorbs oxygen so may facilitate oxy bleaches.	
Sensors for leaks exists.	
FI is easily recyclable and disposable (except reactivity unknown)	

**EXHIBIT E**Potential FuFu Characteristics

- Low surface tension less than 1/2 of H<sub>2</sub>O with detergent (15 dynes/cm<sup>2</sup>) at STP (or at operating condition)
- Viscosity < H<sub>2</sub>O [1 N/M]
- Minimum solubility in water (<10%)
- Density different by more than  $\pm 10\%$  from H<sub>2</sub>O (at operating condition)
- pH Neutral [6.5 - 7.5]
- Non-reactive with bleach? (Highly non-reactive)
- Minimal solvency of oil soil
- Carries enzymes and bleach without restricting their activity (redox potential >y) (enzyme 1/2 life >y)
- low vapor pressure > 7 1/2 at m.

**EXHIBIT F***Project  
HOPE***Meeting Notes for  
Non Aqueous Development Needs**

- 
- 
- 4 For initial patent work go with FI technology
    - └ Make a mixture .... (Solution will be multi-component
    - └ Decision Matrix for Evaluation
      - Define IWF
      - Co-Solvent or Detergent for IWF

**4 We define inert as:**

- Does no cleaning
- Fabric Stability

└ The greatest Area of Concern/Potential is the recovery/rinse, separation, disposal.

- ex. Rynex is misible with H2O so old gravity PERC cleaner is not usable!

**PROPERTIES**

[illegible]

## PROPERTIES

CLASSIFICATION	COMPOUND	INDUSTRIAL USE	WATER SOLUBILITY (GR / 100 GR WATER)	TOXICOLOGY / HAZARDS	SURFACE TENSION	VAPOR PRESSURE (mm Hg)	VAPOR DENSITY	SOLVENCY	REACTIVITY	VISCOSITY (cP)	BOILING POINT (°C)	DENSITY (g/cm³ @ 20°C)	FLASH-POINT (°C)
ALDEHYDES	iso-PENTYL	MFG ARTIFICIAL SILK	2.00	NA		8	2.55	FATS / RESINS			132.0	0.813	45
	METHYL-3-TRIFLUOROMETHYL BENZYL ALCOHOL	MFG FRUIT FLAVORS	10.00	IRITANT				INT / VARNISH	OXIDIZERS		108.0	0.802	28
	n-BUTYL	MFG OF DETERGENTS	7.90	IRITANT		4	2.55	FATS / WAXES	REACTIVE		100.0	0.810	36
	n-HEPTYL	PERFUMES	0.20	IRITANT		0.5		FATS			118.0	0.810	78
	n-HEXYL	MFG OF ANTISEPTICS	0.80			1	4.5		OXIDIZERS		126.0	0.822	78
	n-OCTYL	PERFUMES	0.05	RESPIRATORY		0.14	4.5	ATS / WAXES	OXIDIZERS		156.5	0.819	53
	n-PENTYL	SOLVENT	2.30				3		OXIDIZERS		156.0	0.825	60
	NONOXYNOL	WETTING AGENTS	11.30							175	201.0	0.997	125
	sec-BUTYL	YRNH OF WETTING AGENT	12.50	IRITANT		12.5	2.6		ACIDS		99.5	0.806	31
	TERPEN-4-OL	ESSENCE OF FRUIT FLAVORS	INSOL	IRITANT					OXIDIZERS		88.0	0.803	79
ALCOHOLS	iso-PENTYL	FLAVORING AGENT	12.50	COMBUSTIBLE		12	3		OXIDIZERS		102.0	0.803	21
	2-ETHYLHEXANAL			COMBUSTIBLE			>1.0		OXIDIZERS		97.0	0.802	85
	2-METHYLUNDECANAL			COMBUSTIBLE			>1		OXIDIZERS		55.0	0.822	42
	2-NONENAL			COMBUSTIBLE					OXIDIZERS		171.0	0.830	93
	2-PHENYLPROFIONALDEHYDE			COMBUSTIBLE					OXIDIZERS		86.0	0.846	84
	3-METHYL-2-BUTENAL	FLAVORING AGENT		IRITANT		7			OXIDIZERS		94.0	1.002	76
	BENZALDEHYDE	MFG OF DYES	10.00	IRITANT		4MM	3.7		OXIDIZERS		133.0	0.872	33
	CAPRALDEHYDE	POLYMERIZATION	0.05	IRITANT					OXIDIZERS		178.0	1.042	62
	CYCLOOCTANECARBOXALDEHYDE			IRITANT					OXIDIZERS		131.0	0.814	
	HEPTALDEHYDE			FLAMM IRR		25.68		FATS	OXIDIZERS	0.977	96.0	0.840	67
KETONES	ISOBUTYLALDEHYDE	SYNTHESIS OF CMPS	0.10	IRITANT		66	2.5		OXIDIZERS		53.0	0.784	-16
	METHONE	SEPARATION OF CELLULOSE	11.00	COMBUSTIBLE		0.5	>1.0		OXIDIZERS		207.0	0.883	72
	n-BUTYRALDEHYDE	MFG RESINS	7.00	IRITANT		80	2.5		OXIDIZERS		76.0	0.801	-7
	n-VALERALDEHYDE	FLAVORING CMPO	0.05	MILD					OXIDIZERS		103.0	0.810	12
	NONYLALDEHYDE			IRITANT		0.28	>1		OXIDIZERS		93.0	0.827	63
	PHENYLACETALDEHYDE	SYNTHESIS OF CMPS	0.05	TOXIC		4.83 PSI	2		OXIDIZERS		184.0	1.027	200
	PROFONALDEHYDE		16.00	IRITANT					OXIDIZERS		49.0	0.808	-6
	TETRADECYLALDEHYDE			IRITANT					OXIDIZERS		166.0	0.902	109
	TRIDEKANAL			IRITANT					OXIDIZERS		132.0	0.835	103
	1,1-DIMETHYLCYCLOHEXANE					42	2.4		OXIDIZERS		126.0	0.777	7
ALKANES	1,2-DIMETHYLCYCLOHEXANE								OXIDIZERS		124.0	0.778	15
	BUTYLCYCLOHEXANE								OXIDIZERS		201.0	0.871	41
	LYCALDECANE								OXIDIZERS		201.0	0.871	41
	CYCLODOECANE								OXIDIZERS		245.0	0.880	50
	CYCLOHEPTANE	LACQUERS / RESINS	INSOL	SKIN		44	2.2	OILS	OXIDIZERS		116.0	0.810	9
	CYCLOHEXANE	PAINT REMOVERS	INSOL	SKIN		77	2.9	OILS	OXIDIZERS		61.0	0.776	-18
	CYCLOPENTANE	MFG RESINS	INSOL			5.12 PSI	2.1		OXIDIZERS		48.0	0.740	-10
	CYCLOPENTENE					6.11 PSI			OXIDIZERS		100.0	0.780	-1
	METHYLCYCLOHEXANE	ALKYLATION CMPO	INSOL			37	3.4		OXIDIZERS		92.0	0.750	-3
	METHYLCYCLOPENTANE	PERFUMES	INSOL			232.8	4.9		OXIDIZERS		72.0	0.740	-11
ALKANES	2,2,4,6,8-HEPTAMETHYLNONANE												
	CYCLOOCTANE			NA		41.0	7.9		OXIDIZERS		240.0	0.783	96
	DECANE			IRITANT		18	3.1		OXIDIZERS		151.0	0.814	20
	DODECANE			IRITANT		37	4.9		OXIDIZERS		174.0	0.790	46
	DODECANE			COMBUSTIBLE		41	5.0		OXIDIZERS		200.0	0.776	110
	ETHYLCYCLOPENTANE			FLAMMABLE		1	5.96		OXIDIZERS		2.52	0.719	71
	HEPTADECANE			IRITANT		72.0	3.8		OXIDIZERS		103.0	0.780	15
	HEPTANE	FUELS	INSOL	IRITANT		1	83		OXIDIZERS		302.0	0.777	148
	HEPTANE			IRITANT		40	3.5		OXIDIZERS		95.0	0.699	-12
	HEPTANE	STIMULANTS	INSOL	IRITANT		132	2		OXIDIZERS				

## PROPERTIES

CLASSIFICATION	COMPOUND	INDUSTRIAL USE	WATER SOLUBILITIES (GR / 100 GR WATER)	TOXICOLOGY / HAZARDS	SURFACE TENSION	VAPOR PRESSURE (mm)	VAPOR DENSITY	SOLVENCY	REACTIVITY	VISCOSITY	BOILING POINT (°C)	DENSITY @ 20 °C	FLASH-POINT (°C)
	ISOHXANE		INSOL	FLAMMABLE		140	3		OXIDIZERS		64.0	0.664	-12
	ISOPENTANE	THINNERS	INSOL	IRRITANT		184	2.8		STABLE		28.0	0.620	21
	METHYLPENTANE		INSOL	FLAMMABLE		180	3		OXIDIZERS		33.0	0.670	-12
	NEOPENTANE		INSOL	IRRITANT		41	1		OXIDIZERS		36.0	0.693	-4
	NORADECANE			NA		1	8.27		OXIDIZERS		230.0	0.785	100
	NONANE			INSOL		10	4.41		OXIDIZERS		151.0	0.710	31
	OCTADECANE	EMULSIONS, TEXTILE OIL	INSOL	IRRITANT		1	8.9		OXIDIZERS		128.0	0.703	68
	OCTANE	FUELS	INSOL	IRRITANT		41	3.9		OXIDIZERS		36.0	0.693	13
	PENTANE	FUELS, SYNTHESIS	0.36	IRRITANT		11	6		OXIDIZERS		25.0	0.703	94
	TETRADECANE	WEETING AGENT	INSOL	IRRITANT		1100	8.63		OXIDIZERS		234.0	0.720	79
	TRIDECANE			IRRITANT		1	8.4		OXIDIZERS		156.0	0.740	59
	UNDECANE			IRRITANT		23.4	3.4		OXIDIZERS		171.0	0.743	108
ALKENES	1-DECENE			COMB 1 IRR					OXIDIZERS		197.0	0.765	108
	1-HEPTADECENE			NA					OXIDIZERS		32.0	0.696	-2
	1-HEPTENE			IRRITANT		101	3.1		OXIDIZERS		25.0	0.703	122
	1-HEXADECENE			NA		-0.2	-0.8		OXIDIZERS		34.6	0.675	-7
	1-HEXENE			FLAMM 1 IRR		155	3		OXIDIZERS		179.0	0.709	108
	1-NONENE			COMBUSTIBLE		11	4.35		OXIDIZERS		123.5	0.716	21
	1-OCTADECENE			NA		36	3.9		OXIDIZERS		280.0	0.775	108
	1-OCTENE			FLAMM 1 IRR		151	2.4		OXIDIZERS		30.0	0.643	-4
	1-PENTADECENE			IRRITANT		151	2.4		OXIDIZERS		220.0	0.769	79
	1-PENTENE			COMBUSTIBLE		8.8	8.8		OXIDIZERS		192.0	0.760	62
	1-TRIDECENE			FLAMM 1 IRR					OXIDIZERS		174.0	0.715	101
	1-UNDECENE			COMBUSTIBLE					OXIDIZERS		207.0	0.707	72
	2,3-DIMETHYL-2-BUTENE			COMBUSTIBLE					OXIDIZERS		144.0	0.734	32
	2-BENZYL - 5-NORBORNENE			FLAMM 1 IRR		65	2.4		OXIDIZERS		37.0	0.625	0
	2-METHYL-1-UNDECENE			FLAMMABLE					OXIDIZERS		143.0	0.724	32
	2-METHYL-2-BUTENE			FLAMMABLE		11.8	3		OXIDIZERS		140.0	0.723	27
	2-PENTENE			FLAMMABLE					OXIDIZERS		140.0	0.748	36
	3-PENTENE			FLAMMABLE					OXIDIZERS		140.0	0.748	36
	4-NONENE			FLAMMABLE					OXIDIZERS		140.0	0.748	36
	7-TETRADECENE			FLAMMABLE					OXIDIZERS		140.0	0.748	36
	A-TERPENE			COMB 1 HARM		0.7	4.4		OXIDIZERS		140.0	0.748	36
	G-TERPENE			COMB 1 IRR		0.7	4.7		OXIDIZERS		140.0	0.748	36
ALKYNES	KEROSENE			HARMFUL		0.23	4.5		OXIDIZERS		175.0	0.800	61
	1-DODECENE								OXIDIZERS		215.0	0.716	79
AMIDES	DIETHYLPROPIONAMIDE			INHALANT					OXIDIZERS		77.0	0.857	72
	DIETHYLPROPIONAMIDE	ESTERIFYING AGENT	SOL	IRRITANT					OXIDIZERS		174.0	0.820	62
	PROPIONAMIDE			IRRITANT					OXIDIZERS				
	STEARAMIDE								OXIDIZERS				
AMINES	ACETONITRILE	EXTRACT FATTY ACIDS	SOL	POISON		29.04	1.41		OXIDIZERS		82.0	0.785	5
	1,3-CYCLOHEXANEDIMETHYLAMINE								OXIDIZERS		200.0	0.945	108
	CYCLOUTYLAMINE								OXIDIZERS		61.6	0.633	-4
CARBOXYLIC AC	2,4-DICHLOROPHENETHYLAMINE								OXIDIZERS		64.0	1.009	77
	DIETHYL DODECANEDICARBOXYLATE								OXIDIZERS		183.0	0.951	109
	DIETHYL DODECANEDICARBOXYLATE								OXIDIZERS		130.0	0.887	91
	DIETHYL DODECANEDICARBOXYLATE								OXIDIZERS		312.0	0.993	109
	DIETHYL DODECANEDICARBOXYLATE								OXIDIZERS		282.0	0.982	109

## PROPERTIES

CLASSIFICATION	COMPOUND	INDUSTRIAL USE	WATER SOLUBILITIES (GR / 100 GR WATER)	TOXICOLOGY / HAZARDS	SURFACE TENSION	VAPOR PRESSURE (mm)	VAPOR DENSITY	SOLVENCY	REACTIVITY	VISCOSITY (cP)	BOILING POINT (°C)	DENSITY @ 20 °C	FLASH-POINT (°C)
	DIETHYL SUCCINATE		INSOL	IRITANT					ACID BASE LONID		217.7	1.047	90
	DIETHYL 3-HYDROXYGLUTARATE			NA					OXIDIZERS		139.0	1.192	169
	DIETHYL 3-METHYLGLOUTARATE			IRITANT					ACIDS BASE LONID		109.0	1.085	97
	DIETHYL MALONATE			COMBUSTIBLE					ACIDS BASE LONID		180.0	1.166	89
	DIETHYL METHYLSUCCINATE			IRITANT					ACIDS BASE LONID		196.0	1.078	83
	ETHYL CAPRYLATE			IRITANT					ACIDS BASE LONID		245.0	0.862	167
	ETHYL PENTYLACRYLATE			IRITANT					ACIDS BASE LONID		206.0	0.878	74
	ETHYL UNDECYLENATE			IRITANT					OXIDIZERS		75.0	1.289	1
	ETHYL UNDECYLENATE			IRITANT					OXIDIZERS		258.0	0.879	109
	1,3-CYCLOHEXADIENE			IRITANT					OXIDIZERS		131.0	0.840	101
	1,3-CYCLOHEXADIENE			IRITANT					OXIDIZERS		83.0	0.810	45
	1,4-CYCLOHEXADIENE			IRITANT					OXIDIZERS		46.0	0.774	28
	1,4-CYCLOHEXADIENE			IRITANT					OXIDIZERS		89.5	0.840	51
	1,5-CYCLOOCTADIENE			IRITANT					OXIDIZERS		150.0	0.882	31
	1,5-DIMETHYL-1,5-CYCLOOCTADIENE			IRITANT					OXIDIZERS		74.0	0.867	55
	1,6-NONADIENE			IRITANT					OXIDIZERS		141.0	0.740	26
	1,5-DECADIENE			IRITANT					OXIDIZERS		169.0	0.750	41
	METHYL HEPTYLACRYLATE			IRITANT					OXIDIZERS		80.0	1.472	100
	4-OBASIC ESTER			IRITANT					OXIDIZERS		200.0	1.117	84
	6-OBASIC ESTER			IRITANT					OXIDIZERS		93.0	1.087	103
	DIETHYL ESTER			IRITANT					OXIDIZERS		298.0	1.118	159
	ETHYL CAPRYLATE			IRITANT					OXIDIZERS		158.0	0.873	49
	ETHYL FORMATE			IRITANT					OXIDIZERS		52.0	0.817	-16
	ETHYL UNDECYLENATE			IRITANT					OXIDIZERS		105.9	0.899	109
	METHYL 2-TRIMETHYLSILYL-2-HEPTANOATE			IRITANT					OXIDIZERS		78.0	0.823	58
	METHYL 2-ANONATE			IRITANT					OXIDIZERS		121.0	0.915	100
	METHYL CAPRYLATE			IRITANT					OXIDIZERS		151.0	0.905	44
	METHYL CAPRYLATE			IRITANT					OXIDIZERS		194.0	0.877	72
	METHYL CYCLOHEXYLACRYLATE			IRITANT					OXIDIZERS		201.0	0.951	74
	METHYL DECANOATE			IRITANT					OXIDIZERS		108.0	0.873	94
	METHYL NONANOATE			IRITANT					OXIDIZERS		213.0	0.875	84
	METHYL PHENOXYACETATE			IRITANT					OXIDIZERS		243.0	1.148	109
	METHYL TRIDECANOATE			IRITANT					OXIDIZERS		131.0	0.864	100
	METHYL UNDECANOATE			IRITANT					OXIDIZERS		134.0	0.872	100
	2-HYDROXYETHYL ETHER			IRITANT					OXIDIZERS		52.0	1.404	1
	ALLYL PHENYL ETHER			IRITANT					OXIDIZERS		245.0	1.118	143
	ANISOLE			IRITANT					OXIDIZERS		182.0	0.978	67
	DIETHYLENE GLYCOL DIETHYL ETHER			IRITANT					OXIDIZERS		154.0	0.995	51
	ETHYL HEPTANOATE			IRITANT					OXIDIZERS		180.0	0.899	71
	ETHYL PHENYL ETHER			IRITANT					OXIDIZERS		188.0	0.868	66
	HEXAFUORO DIETHYL ETHER			IRITANT					OXIDIZERS		170.0	0.968	67
	HEXYL ETHER			IRITANT					OXIDIZERS		93.0	1.410	NONE
	ISOPROPYL ETHER			IRITANT					OXIDIZERS		228.0	0.789	78
	PENTYL ETHER			IRITANT					OXIDIZERS		98.0	0.726	-12
	PROPYL ETHER			IRITANT					OXIDIZERS		187.0	0.786	57
	1-FLUOROPENTANE			IRITANT					OXIDIZERS		63.0	0.769	17
	2,2-DIMETHYL-1,3,7,7,8,8-HEPTAFLUORO-3,5-OCTANEDIONE			IRITANT					OXIDIZERS		47.0	1.273	36
	2,2,3,3,4,4,4-HEPTAFLUORO-1-BUTANOL			IRITANT					OXIDIZERS		96.0	1.600	74
	2,2,3,3,4,4,5,5,6,6,7,7,8,8-PENTADecaFLUORO-1-OCTANOL			IRITANT					OXIDIZERS		153.0	0.608	100
	2,2,3,3-TETRAFLUORO-CYCLOBUTANE CARBONITRILE			IRITANT					OXIDIZERS		148.0	1.391	54
	2,2,3,3,4,4-HEXAFLUORO-1-BUTANOL			IRITANT					OXIDIZERS		114.0	1.557	51
	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,17,17,18,18,19,19,20,20,21,21,22,22,23,23,24,24,25,25,26,26,27,27,28,28,29,29,30,30,31,31,32,32,33,33,34,34,35,35,36,36,37,37,38,38,39,39,40,40,41,41,42,42,43,43,44,44,45,45,46,46,47,47,48,48,49,49,50,50,51,51,52,52,53,53,54,54,55,55,56,56,57,57,58,58,59,59,60,60,61,61,62,62,63,63,64,64,65,65,66,66,67,67,68,68,69,69,70,70,71,71,72,72,73,73,74,74,75,75,76,76,77,77,78,78,79,79,80,80,81,81,82,82,83,83,84,84,85,85,86,86,87,87,88,88,89,89,90,90,91,91,92,92,93,93,94,94,95,95,96,96,97,97,98,98,99,99,100,100,101,101,102,102,103,103,104,104,105,105,106,106,107,107,108,108,109,109,110,110,111,111,112,112,113,113,114,114,115,115,116,116,117,117,118,118,119,119,120,120,121,121,122,122,123,123,124,124,125,125,126,126,127,127,128,128,129,129,130,130,131,131,132,132,133,133,134,134,135,135,136,136,137,137,138,138,139,139,140,140,141,141,142,142,143,143,144,144,145,145,146,146,147,147,148,148,149,149,150,150,151,151,152,152,153,153,154,154,155,155,156,156,157,157,158,158,159,159,160,160,161,161,162,162,163,163,164,164,165,165,166,166,167,167,168,168,169,169,170,170,171,171,172,172,173,173,174,174,175,175,176,176,177,177,178,178,179,179,180,180,181,181,182,182,183,183,184,184,185,185,186,186,187,187,188,188,189,189,190,190,191,191,192,192,193,193,194,194,195,195,196,196,197,197,198,198,199,199,200,200,201,201,202,202,203,203,204,204,205,205,206,206,207,207,208,208,209,209,210,210,211,211,212,212,213,213,214,214,215,215,216,216,217,217,218,218,219,219,220,220,221,221,222,222,223,223,224,224,225,225,226,226,227,227,228,228,229,229,230,230,231,231,232,232,233,233,234,234,235,235,236,236,237,237,238,238,239,239,240,240,241,241,242,242,243,243,244,244,245,245,246,246,247,247,248,248,249,249,250,250,251,251,252,252,253,253,254,254,255,255,256,256,257,257,258,258,259,259,260,260,261,261,262,262,263,263,264,264,265,265,266,266,267,267,268,268,269,269,270,270,271,271,272,272,273,273,274,274,275,275,276,276,277,277,278,278,279,279,280,280,281,281,282,282,283,283,284,284,285,285,286,286,287,287,288,288,289,289,290,290,291,291,292,292,293,293,294,294,295,295,296,296,297,297,298,298,299,299,300,300,301,301,302,302,303,303,304,304,305,305,306,306,307,307,308,308,309,309,310,310,311,311,312,312,313,313,314,314,315,315,316,316,317,317,318,318,319,319,320,320,321,321,322,322,323,323,324,324,325,325,326,326,327,327,328,328,329,329,330,330,331,331,332,332,333,333,334,334,335,335,336,336,337,337,338,338,339,339,340,340,341,341,342,342,343,343,344,344,345,345,346,346,347,347,348,348,349,349,350,350,351,351,352,352,353,353,354,354,355,355,356,356,357,357,358,358,359,359,360,360,361,361,362,362,363,363,364,364,365,365,366,366,367,367,368,368,369,369,370,370,371,371,372,372,373,373,374,374,375,375,376,376,377,377,378,378,379,379,380,380,381,381,382,382,383,383,384,384,385,385,386,386,387,387,388,388,389,389,390,390,391,391,392,392,393,393,394,394,395,395,396,396,397,397,398,398,399,399,400,400,401,401,402,402,403,403,404,404,405,405,406,406,407,407,408,408,409,409,410,410,411,411,412,412,413,413,414,414,415,415,416,416,417,417,418,418,419,419,420,420,421,421,422,422,423,423,424,424,425,425,426,426,427,427,428,428,429,429,430,430,431,431,432,432,433,433,434,434,435,435,436,436,437,437,438,438,439,439,440,440,441,441,442,442,443,443,444,444,445,445,446,446,447,447,448,448,449,449,450,450,451,451,452,452,453,453,454,454,455,455,456,456,457,457,458,458,459,459,460,460,461,461,462,462,463,463,464,464,465,465,466,466,467,467,468,468,469,469,470,470,471,471,472,472,473,473,474,474,475,475,476,476,477,477,478,478,479,479,480,480,481,481,482,482,483,483,484,484,485,485,486,486,487,487,488,488,489,489,490,490,491,491,492,492,493,493,494,494,495,495,496,496,497,497,498,498,499,499,500,500,501,501,502,502,503,503,504,504,505,505,506,506,507,507,508,508,509,509,510,510,511,511,512,512,513,513,514,514,515,515,516,516,517,517,518,518,519,519,520,520,521,521,522,522,523,523,524,524,525,525,526,526,527,527,528,528,529,529,530,530,531,531,532,532,533,533,534,534,535,535,536,536,537,537,538,538,539,539,540,540,541,541,542,542,543,543,544,544,545,545,546,546,547,547,548,548,549,549,550,550,551,551,552,552,553,553,554,554,555,555,556,556,557,557,558,558,559,559,560,560,561,561,562,562,563,563,564,564,565,565,566,566,567,567,568,568,569,569,570,570,571,571,572,572,573,573,574,574,575,575,576,576,577,577,578,578,579,579,580,580,581,581,582,582,583,583,584,584,585,585,586,586,587,587,588,588,589,589,590,590,591,591,592,592,593,593,594,594,595,595,596,596,597,597,598,598,599,599,600,600,601,601,602,602,603,603,604,604,605,605,606,606,607,607,608,608,609,609,610,610,611,611,612,612,613,613,614,614,615,615,616,616,617,617,618,618,619,619,620,620,621,621,622,622,623,623,624,624,625,625,626,626,627,627,628,628,629,629,630,630,631,631,632,632,633,633,634,634,635,635,636,636,637,637,638,638,639,639,640,640,641,641,642,642,643,643,644,644,645,645,646,646,647,647,648,648,649,649,650,650,651,651,652,652,653,653,654,654,655,655,656,656,657,657,658,658,659,659,660,660,661,661,662,662,663,663,664,664,665,665,666,666,667,667,668,668,669,669,670,670,671,671,672,672,673,673,674,674,675,675,676,676,677,677,678,678,679,679,680,680,681,681,682,682,683,683,684,684,685,685,686,686,687,687,688,688,689,689,690,690,691,691,692,692,693,693,694,694,695,695,696,696,697,697,698,698,699,699,700,700,701,701,702,702,703,703,704,704,705,705,706,706,707,707,708,708,709,709,710,710,711,711,712,712,713,713,714,714,715,715,716,716,717,717,718,718,719,719,720,720,721,721,722,722,723,723,724,724,725,725,726,726,727,727,728,728,729,729,730,730,731,731,732,732,733,733,734,734,735,735,736,736,737,737,738,738,739,739,740,740,741,741,742,742,743,743,744,744,745,745,746,746,747,747,748,748,749,749,750,750,751,751,752,752,753,753,754,754,755,755,756,756,757,757,758,758,759,759,760,760,761,761,762,762,763,763,764,764,765,765,766,766,767,767,768,768,769,769,770,770,771,771,772,772,773,773,774,774,775,775,776,776,777,777,778,778,779,779,780,780,781,781,782,782,783,783,784,784,785,785,786,786,787,787,788,788,789,789,790,790,791,791,792,792,793,793,794,794,795,795,796,796,797,797,798,798,799,799,800,800,801,801,802,802,803,803,804,804,805,805,806,806,807,807,808,808,809,809,810,810,811,811,812,812,813,813,814,814,815,815,816,816,817,817,818,818,819,819,820,820,821,821,822,822,823,823,824,824,825,825,826,826,827,827,828,828,829,829,830,830,831,831,832,832,833,833,834,834,835,835,836,836,837,837,838,838,839,839,840,840,841,841,842,842,843,843,844,844,845,845,846,846,847,847,848,848,849,849,850,850,851,851,852,852,853,853,854,854,855,855,856,856,857,857,858,858,859,859,860,860,861,861,862,862,863,863,864,864,865,865,866,866,867,867,868,868,869,869,870,870,871,871,872,872,873,873,874,874,875,875,876,876,877,877,878,878,879,879,880,880,881,881,882,882,883,883,884,884,885,885,886,886,887,887,888,888,889,889,890,890,891,891,892,892,893,893,894,894,895,895,896,896,897,897,898,898,899,899,900,900,901,901,902,902,903,903,904,904,905,905,906,906,907,907,908,908,909,909,910,910,911,91												

## PROPERTIES

CLASSIFICATION	COMPOUND	INDUSTRIAL USE	WATER SOLUBILITIES (GR / 100 GR WATER)	TOXICOLOGY / HAZARDOUS	SURFACE TENSION	VAPOR PRESSURE (mm)	VAPOR DENSITY	SOLVENCY	REACTIVITY	VISCOSITY (cP)	BOILING POINT (°C)	DENSITY @ 20°C	FLASH-POINT (°C)	
FLUOROCARBON	2,3,4,5-TETRAFLUOROACETOPHENONE			IRRITANT					OXIDIZING		83.0	1.408	68	
	2,3,4,5-PENTAFLUOROACETOPHENONE			COMBUSTIBLE					OXIDIZING		130.0	1.476	65	
	3,3,4,4,5,5,6,6,7,7,8,8,8-NONAFLUORO-1-HEXENE			FLAMMABLE		0.5	8.5		OXIDIZING		59.0	1.418	-17	
	3,3,4,4,5,5,6,6,7,7,8,8,8-TRIDECAFLUORO-1-OCTENE			FLAMMABLE					OXIDIZING		276.0	1.570	19	
	3,3,4,4,5,5,6,6,7,7,8,8,8,8-TETRADECAFLUORO-1-DECENE			COMB IRR					OXIDIZING		176.0	1.677	51	
	DODECAFLUOROCYCLOHEXANE		SOLID							OXIDIZING				NO RE
	FLUORINERT-104		11.00			14	29			STABLE	0.8	101.0	1.770	228
	FLUORINERT-40		7.00	NO KNOWN		16	3			STABLE	2.2	155.0	1.670	270
	FLUORINERT-43		7.00	NO KNOWN		40	1.3			STABLE	2.2	174.0	1.600	244
	FLUORINERT-70		8.00	NO KNOWN		18	-0.1			STABLE	14	215.0	1.630	335
FLUOROCARBON	FLUORINERT-71		8.00	NO KNOWN		18	-0.02		STABLE	-50	253.0	1.600	373	
	FLUORINERT-72		10.00	NO KNOWN		12	23.2 TORR		STABLE	0.4	56.0	1.600	178	
	FLUORINERT-75		11.00	NO KNOWN		15	31		STABLE	0.8	102.0	1.710	227	
	FLUORINERT-77		13.00	NO KNOWN		15	42		STABLE	0.55	86.0	1.730	205	
	FLUORINERT-84		11.00	NO KNOWN		12	79		STABLE	0.8	120.0	1.745	NO RE	
	PERFLUORINEPTANE			IRRITANT					OXIDIZING	137.0	1.650	59		
	PERFLUOROETHYL DECALIN			IRRITANT					OXIDIZING	58.0	1.609	NO RE		
	PERFLUOROCYCLOHEXANE			IRRITANT					OXIDIZING	266.0	1.613	109		
	1,2-DIMETHYLNAPHTHALENE		INSOL					FATS, OILS						
	KETONES	2,4-DIMETHYLCYCLOPENTANONE			COMBUSTIBLE					OXIDIZING				
4,4-DIFLUOROACETOPHENONE				IRRITANT					OXIDIZING					
2-CYCLOHEPTEN-1-ONE									OXIDIZING					
2-DECANONE									OXIDIZING					
2-METHYL-1-TETRALONE				NA					OXIDIZING					
2-METHYL-3-HEPTANONE				COMBUSTIBLE					OXIDIZING					
2-NONANONE				IRRITANT					OXIDIZING					
2-OCTANONE				COMBUSTIBLE					OXIDIZING					
2-PENTANONE				FLAMMABLE					OXIDIZING					
2-UNDECANONE			0.30	COMBUSTIBLE					OXIDIZING					
KETONES	3-HEPTANONE			COMBUSTIBLE					OXIDIZING					
	3-HEXANONE		0.26	COMBUSTIBLE					OXIDIZING					
	3-METHYL-2-CYCLOHEXEN-1-ONE			COMBUSTIBLE					OXIDIZING					
	3-METHYL-2-PENTANONE								OXIDIZING					
	3-NOVANONE			COMBUSTIBLE					OXIDIZING					
	3-NONEN-2-ONE			COMBUSTIBLE					OXIDIZING					
	3-OCTANONE			COMBUSTIBLE					OXIDIZING					
	3-PENTANONE			COMBUSTIBLE					OXIDIZING					
	4-HEPTANONE			COMBUSTIBLE					OXIDIZING					
	4-METHYLCYCLOHEXANONE		5.00	COMBUSTIBLE					OXIDIZING					
KETONES	5-METHYL-2-HEXANONE			COMBUSTIBLE					OXIDIZING					
	5-METHYL-3-HEPTANONE			COMBUSTIBLE					OXIDIZING					
	6-UNDECANONE			COMBUSTIBLE					OXIDIZING					
	ACETONE			COMBUSTIBLE					OXIDIZING					
	ACETONYLACETONE			COMBUSTIBLE					OXIDIZING					
	BENZYLACETONE			COMBUSTIBLE					OXIDIZING					
	CYCLOBUTANONE			COMBUSTIBLE					OXIDIZING					
	CYCLOBUTYL PHENYL KETONE			COMBUSTIBLE					OXIDIZING					
	CYCLODECANONE			COMBUSTIBLE					OXIDIZING					
	CYCLOHEPTANONE			COMBUSTIBLE					OXIDIZING					
KETONES	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					
	1,2-DIMETHYLNAPHTHALENE			IRRITANT					OXIDIZING					

## PROPERTIES

CLASSIFICATION	COMPOUND	INDUSTRIAL USE	WATER SOLUBILITIES (GR / 100 GR WATER)	TOXICOLOGY / HAZARDS	SURFACE TENSION	VAPOR PRESSURE (mm Hg)	VAPOR DENSITY	SOLVENCY	REACTIVITY	VISCOSITY (cP)	BOILING POINT (°C)	DENSITY @ 20 °C	FLASH POINT (°C)
	CYCLOPROPYL 4-FLUOROPHENYL KETONE								OXIDIZERS		120.0	1.144	98
	CYCLOPROPYL PHENYL KETONE						5		OXIDIZED		123.0	1.056	80
	HEXAFLUOROACETYLACETONE								OXIDIZED		71.9	1.470	NONE
	METHYL ISOBUTYL KETONE		190	HARMFUL		15	3.5		STABLE		117.0	0.801	13
	OCTANOPHENONE			HAZARDOUS					OXIDIZERS		265.0	0.836	109
NAPHTHENES	CYCLOHEXANE			HARMFUL		77	2.9		OXIDIZERS		81.0	0.779	-17
CYCLOALKANES	CYCLOPENTANE			HARMFUL		21.4	2		OXIDIZERS		50.0	0.751	1
	METHYLCYCLOHEXANE			FLAMMABLE		37	3.4		OXIDIZERS		101.0	0.770	-3
	1,2-DIMETHYLCYCLOHEXANE			FLAMMABLE		31	3.5		OXIDIZERS		124.0	0.728	15
TERPENES	CITRONELLO			IRRITANT		0.02	5.4		OXIDIZERS		222.0	0.861	98
	ISOPRENE			TOXIC		33	2.35		V REACTIVE		34.0	0.861	18
	TERPENE		183%	TOXIC		0.8	4.7		AIR		173.0	0.837	46
MISCELLANEOUS	WATER		INF	NOXIOUS		23.7							
	PERCHLOROETHYLENE			TOXIC		13	5.83		BASES		100.0	1.080	374
											121.0	1.823	NONE

## EXHIBIT H

**Whirlpool Information Network**

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**Edit**

**Type of Report:** WIN Summary  
**Title:** HOPE, 1996 - 1998  
**Authors:** Database  
**Location:** Research & Engineering  
**Product Category:** Project Data  
**Technical Category:** Notes Databases  
**Related Materials:** Contains 137 documents from 1996-1998

**Project Number:**  
**Report Date:** 03/01/1996

**Report:**

This db was for non-aqueous wash system development. Project leaders were Dan Conrad and Mark Kovich. Other team members included Earl Meister and Tre Wright.

Topics included chemicals tested, Cleaning potential of Triton GR-7M surfactant, Final Chemical Report for Project Athena, Experimental Results and Analysis of Displacement Fluids for Drying, Petroferm chemicals, and Oxiclear Gas Purifiers and Filters.

Team members can open the database with this link - [Category View](#). It will ask you to authenticate with your userid and http/Domino password (REFP). If you do not have access to this database and would like more information, contact one of the names listed above or Gloria Begor at the Technical Information Center. From the Notes client this db can be found on ADCNS1 in the directory/folder 'projects'.

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Entered on 02/10/2003 by Sally J Pollock/BentonHarborUS/E/Whirlpool  
Not yet edited by anyone other than the Author

## Project HOPE - Discussion Topic

C2C stage: Ideation

Project Number:

Document Author: Daniel C Conrad

Date Composed: 03/01/1996

Subject\*: G.N.A.W. the magic "FuFu" dust

Category\*: Presentations & Communications

Sub-Category: Intellectual Property If other, indicate here:

Text of Topic:

Presentation put together by Steve Krefman on the issues related to "Fu Fu" in the arena of General Non Aqueous Wash (GNAW)



FUFU.PPT

**File Attachments** (after viewing, use the Back arrow to return to this screen)

**Attachment Types:**

Entered by Daniel C Conrad 01-Mar-96 at 05:20 PM

## Project HOPE - Discussion Topic

**C2C stage:** Ideation**Project Number:****Document Author:** Daniel C Conrad**Date Composed:** 03/07/1996**Subject\*:** FuFu Brainstroming Notes**Category\*:** Ideation History**Sub-Category:** Brainstorm Notes**If other, indicate here:****Text of Topic:** Project HOPE initiation brainstorming notes by Steve Krefman

FUFU.DOC

**File Attachments** (after viewing, use the **Back** arrow to return to this screen)**Attachment Types:**

Entered by Daniel C Conrad 07-Mar-96 at 04:19 PM

## Project HOPE - Discussion Topic

**C2C stage:** Ideation**Project Number:****Document Author:** Mark B. Kovich**Date Composed:** 05.06/1996**Subject\*:** Updated Non-Aqueous Matrix**Category\*:** Environmental Scan**Sub-Category:** Chemistry **If other, indicate here:****Text of Topic:** This is the updated version of the matrix. I will continue to update this as more information becomes available.

MATRIX.XLS

**File Attachments** (after viewing, use the Back arrow to return to this screen)**Attachment Types:** Excel

Entered by Mark B. Kovich 06-May-96 at 09:55 AM

## Project HOPE - Discussion Topic

C2C stage: Ideation

Project Number:

Document Author: Catherine Tong

Date Composed: 09/04/1996

Subject\*: Detergent Properties of Hydrocarbons, Fluorocarbons, and Microemulsions

Category\*: Test Results

Sub-Category: Testing If other, indicate here:

Text of Topic: This is report 517720-005.



TONG.DOC



RPT005.XLS

File Attachments (after viewing, use the Back arrow to return to this screen)

Attachment Types: Word, Excel

Entered by Catherine Tong 04-Sep-96 at 10:13 AM

Report 517720-005

## EXHIBIT I



49022-0026

CORPORATE TECHNOLOGY DEVELOPMENT  
LAUNDRY APPLICATIONS  
The Elisha Gray II  
Research and Engineering Center  
750 Monte Road  
Benton Harbor, Michigan

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**TITLE:** Detersive Properties of Hydrocarbons, Fluorocarbons, and  
Microemulsions

**DATE:** 15 August, 1996

**PROJECT #:** 517720-005

**BY:** Catherine Tong  
Mark Kovich  
Tremitchell Wright

---

### DISTRIBUTION LIST:

Dr. Daniel Conrad  
Steve Krefman  
Technical Information Center

Report 517720-001

### Summary

The purpose of this investigation is to discover a water replacement as well as a cleaning agent that can be used in a non-aqueous wash process. Table 1 displays a list of the variety of fluids from different chemical families that were tested. These include alcohols, carboxylic acids, esters, fluorocarbons, ketones, terpenes, and microemulsions. The fluids were evaluated based on the wash performance on selected swatches. A matrix of the fluids and the observations from each test can be found in Table 2. Figures 2-4 show the wash performance of the various fluids. The numerical results of the tests can be found in Tables 3-4.

From the observations and testing generated so far, the fluorinated compounds are likely candidates for a water replacement. However, the compounds have demonstrated inferior detergent performance to Tide. Neat solutions which are ones that are only composed of one chemical compound are not necessarily the way to go. Because of the complexity of different types of stains and soils, a cosolvent or multicomponent mixture containing an inert working fluid will most likely be needed in the non-aqueous cleaning process to achieve all fabric care.

### Background

Environmental and health concerns have increased regarding chlorinated solvents such as perchloroethylene, trichloroethylene, methylene chloride, and 1,1,1-trichloroethane. In 1987, the *Montreal Protocol on Substances That Deplete the Ozone Layer* was signed to protect the stratospheric ozone layer. The treaty specifies that the production and consumption of chlorofluorocarbons, halons, and carbon tetrachloride are to be phased out by the year 2000. Scientific evidence suggests that these compounds deplete the ozone layer that shields the planet from damaging UV-B radiation. Therefore, new non-ozone depleting, nontoxic, and low global warming potential cleaning agents that work as well as the chlorinated solvents if not better have been the focus of research in the cleaning industry.

In the dry cleaning industry, perchloroethylene is used as the preferred solvent for delicate fabrics. Research has been centered on finding better recovery systems for this fluid so that it doesn't leak into the atmosphere as well as searching for alternative chemistries that can be used in the dry cleaning system. For example, prototype CO<sub>2</sub> dry-cleaning processes have been documented. New solvents that are discovered for washing garments could also be used in wash systems for the home.

The ultimate goal of the non-aqueous wash project is the "perfect care of all fabrics requiring no time and effort." Therefore, many different types of fabrics were used in the testing of the detergent properties of the fluids. The swatches used include AS-9 Cotton, PC-9 Blend, Clay, Wool, Silk, Nylon, and Rayon. Most of the testing was done on the AS-9 Cotton since only a limited amount of certain fluids was available. AS-9

Report 517720-005

is a cotton swatch that is soiled with pigment oil. PC-9 is a polyester/cotton blend that is also soiled with pigment oil. The Clay is a cotton swatch that is soiled with a bandy black research clay. The Wool, Silk, Nylon, and Rayon are swatches that are soiled with dust sebum. Testing the deterative properties of the fluids on these various swatches will help evaluate the vision of the non-aqueous wash project. However, the remaining portion of the report will focus mostly on differences seen using AS-9.

The purpose of this investigation is to identify chemistries that can be used in the non-aqueous wash process for home use. The non-aqueous wash process is washing without water. Water can cause swelling of the fibers within the fabric and damage the garment. The discovery of a water replacement as well as a cleaning agent is the focus of the investigation. A variety of fluids from different chemical families were tested. These include alcohols, carboxylic acids, esters, fluorocarbons, ketones, terpenes, and microemulsions. These fluids were picked based on safety reasons as well as on information obtained from scientific literature. Most of the fluids have a relatively high flash point which is the lowest temperature at which vapors above a volatile combustible substance ignite in air when exposed to flame. Some of the fluids like the hydrofluoroethers have already been used in the metal cleaning industry. Compounds with a low vapor pressure, low viscosity, or a low surface tension were also considered. Benefits of these characteristics are as follows; a low vapor pressure fluid dries quickly. A low viscosity and a low surface tension fluid can speed up the wetting of the fabric during the wash process and may promote particulate soil removal. A list of the various compounds along with the chemical families to which they belong is in Table 1.

#### Test Setup

In this test, there were basically two methods used to find the deterative properties of the fluids. The first test involved using a tergotometer which models a washing machine. The tergotometer has a vertical axis that twists clockwise and counterclockwise and was set to agitate at 100 spins per minute. The containers of the tergotometer were sealed by screws around the perimeter of the cover, and reflux condensers were placed in a hole on the cover to condense any vapors from the fluids. Five swatches were agitated in one liter of fluid in the machine for five minutes.

The second test was done in beakers. Some of the fluids could only be ordered in quantities smaller than the volume of the tergotometer. Since this was the case, some fluids were tested in beakers with swatches washed one at a time under a fume hood. The swatches were stirred in the beakers in a way similar to the rotation of the tergotometer axis for five minutes. The detailed procedure of the test method is located in Figure 1.

#### Results

Report 517720-005

All results are reported in Delta Y values and are compared to the baseline value obtained from testing with Tide. As a rule of thumb, a Delta Y value of three or greater can usually be visible. Besides washability, other observations include drying times, odors, and fabric damage as noted. A matrix of the fluids and the observations from each test can be found in Table 2. The numerical results of the tests can be found in Tables 3-4.

#### Washability

Fluorinert was the only compound besides Tide that was tested with all seven types of swatches. It is a fluorinated compound produced by 3M. Fluorinert performs inferior to Tide. Figure 2 compares these two fluids in their washing capabilities.

Most of the testing was done on the AS-9 Cotton swatches since most fluids were not available in substantial amounts. Figure 3 shows the Delta Y values of the tergotometer test with the fluids grouped according to their respective chemical families. With this method, the fluids that performed the closest to Tide were the Inverts. Inverts are microemulsions developed by Dow that are 50% water and 50% solvents and surfactants. All other fluids tested with this method did not perform up to Tide's standards. The alcohol, ether, ketones, one of the carboxylic acids, and one of the fluorinated compounds performed similar in their Delta Y values to each other. Triton X-100 caused a negative Delta Y value. This might be due to residues or splotches left on the swatch after a significantly long drying period.

Due to insufficient volumes of fluid, a beaker test was used to evaluate AS 9 swatches. Of the fluids tested in this manner, only Tarksol, an aqueous degreaser from Terpene Technologies, with a water rinse performed similar to Tide. All other fluids tested performed inferior to Tide. The terpenes had varying ability to clean fabrics. The fluorinated compounds performed inferior to the esters, terpenes, and one of the carboxylic acids. The other carboxylic acid, diethyl dodecanedioate, resulted in a negative Delta Y value. Again, this might be due to residues or splotches left on the swatch. Perhaps a solvent rinse or increased temperatures would speed up the drying process and not leave residues on the swatches. The results are shown in Figure 4.

#### Drying Times

Drying times are also an important observation from these tests. The swatches were mostly hung dry in the fume hood with the exception of the Tide and Fluorinert which were laid flat to dry. Quick drying times can mean faster laundry cycle times for the consumer as well as less energy used. The ability to dry quickly can somewhat be attributed to a physical property of the fluid called vapor pressure. A fluid with a low vapor pressure has the ability to evaporate quickly and efficiently, causing the fabric to dry almost immediately after the wash. The compounds with this property are the fluorocarbons. Some other fluids

Report 517720-005

like 2-pentanone and  $\alpha$ -terpinene dry relatively quickly as well when compared to water. The remaining fluids require drying times from two hours to two days. Figure 5 shows a spectrum of these drying times.

#### Fabric Damage

Because any damage to the garment caused by washing with solvents would not be beneficial to the consumer, a preliminary fabric damage assessment is necessary. Indications of fabric damage include fraying at the edges of the swatch and no retainment of the texture of the fabric. With respect to the swatches washed in Fluorinert, there doesn't appear to be any fabric damage, not even to wool. Tide caused substantial fraying of the wool swatches. As to the AS-9 cotton swatches, none of them seem to be damaged from a visual inspection.

#### Odors

Many of the fluids have different odors associated with them. The various smells might have to be masked by perfumes or other agents during the wash process. One group without any odors are the fluorocarbons. Most of the fluids emit bad odors, but some of them exhibit a fruity smell. These include the terpenes such as the Inverts and the Invert Detergents, which are produced from natural products like citrus and pine oils.

#### Conclusion

From the observations and testing generated so far, the fluorinated compounds are likely candidates for a water replacement. They can be considered good inert working fluids which are ones that show little or no detergent properties and do not cause swelling of the fibers in the fabric. They are non-reactive with any chemicals or with the garment. With the limited number of tests performed, the compounds have demonstrated inferior detergent performance to Tide. Neat solutions which are ones that are only composed of one chemical compound are not necessarily the way to go. Because of the complexity of different types of stains and soils, a cosolvent or multicomponent mixture containing an inert working fluid will most likely be needed in the non-aqueous cleaning process to achieve all fabric care.

There are many other experiments that are needed to fully evaluate a fluid for use in the non-aqueous wash process. Some further testing such as surface tension, dimensional stability of the swatch, and the solvency of the fluid can provide more insight into the potential for a home non-aqueous wash system.

Figure 1

#### Test Methods

Report 517720-001

*Detergent Evaluation.* Two types of tests were used in determining the detergent properties of the fluids. Test I was done in the tergotometer while Test II was done in beakers. The swatches used include AS-9 Cotton, PC-9 Blend, Clay, Wool, Silk, Nylon, Rayon, and CS-4 Oily.

Tergotometer Test (for Tide)

1. Read 5 swatches of one type on the colorimeter.
2. Add 1L of water at a given temperature and 4 ml of Tide into a tergotometer container.
3. Place the 5 swatches into the container.
4. Agitate for 5 minutes at 100 rpm.
5. Rinse the swatches in 70°F water for 5 minutes.
6. Remove the swatches and air dry.
7. Read swatches on the colorimeter.
8. Repeat the procedure 2 more times at the given temperature.
9. Repeat the procedure at three temperatures: 70°F, 100°F, and 140°F

Tergotometer Test (for other non-aqueous fluids)

1. Read 5 swatches of one type on the colorimeter.
2. Add 1L of fluid into a tergotometer container.
3. Place the 5 swatches into the container.
4. Agitate for 5 minutes at 100 rpm and at 70°F.
5. Remove the swatches and hang dry in the fume hood.
6. Read swatches on the colorimeter.
7. Repeat the procedure 2 more times if enough fluid.

Beaker Test

1. Read 5 swatches of one type on the colorimeter.
2. Add 50 ml of fluid into a beaker.
3. Place 1 swatch into the beaker.
4. Stir with a stirring rod for 5 minutes.
5. Remove the swatch and hang dry in the fume hood.
6. Repeat the procedure 4 more times.
7. Read the swatches on the colorimeter.